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Pedagogical Experiment and Modeling of the Learning Process for Assessing Knowledge about the Criteria Assessment System

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ABSTRACT: This article addresses the need for criterion-based evaluation in educational reform, focusing on the goals and tasks of planning in the updated educational system. Through pedagogical experiments, the study explores the role of 21st-century teacher competencies in developing students' skills and provides a detailed understanding of assessment types, procedures, and characteristics. The methodology reveals the structure of formative and summative evaluations, offering practical examples and scientific evidence to guide the implementation of criterion-based assessments in schools. The findings highlight the importance of clear evaluation standards and tools for effective teaching and learning. Pedagogical and psychological aspects of competence formation are researched and based. These aspects have formed the values of subject skills and criterion evaluation, defining the important concept of evaluation.

Keywords: interpretation, assessment tool, education, gnosticism, geographical thinking, competence, pedagogy

I. INTRODUCTION

We all know that the very intensity of global developments and changes in the world is very relevant in the implementation of changes in the field of education in Kazakhstan, that is why the "ontology" (fundamental meaning) of education has been deeply studied and a turn has been made to innovation. Criterion-referenced assessment is an evaluation method where a student's performance is measured against a set of predefined learning standards or specific criteria, rather than comparing their performance to that of other students. This approach allows educators to assess whether students have mastered particular skills or knowledge outlined in the curriculum. The criterion-referenced assessment system has gained global relevance due to its focus on aligning educational outcomes with specific learning goals, making it a critical tool in fostering 21st-century skills. In Kazakhstan, this system has been integrated into educational reforms aimed at preparing students for global competitiveness, with the "Teacher Leadership in Schools" program highlighting modules such as "Assessment for Learning and Assessment of Learning." This program, rooted in innovation, emphasizes the importance of developing critical thinking, leadership, and other essential skills, while the criterion-based approach ensures clear, measurable outcomes aligned with updated educational standards [1].

II. PROBLEM STATEMENT

The research addresses the question: How can criterion-referenced assessment be effectively implemented within the Kazakhstani educational system to develop 21st-century skills and enhance student learning outcomes in a rapidly changing global context? Currently, there is an opinion that only long-term, medium-term, short-term planning and criterion evaluation of the updated educational program is being formed. Therefore, let's talk about

the features of the updated educational program, since it has its own characteristics according to the goals and objectives of any program:

the spiral principle of subject content design, i.e. gradual expansion of educational material vertically and horizontally in increasing knowledge and skills (complexity of knowledge by topics and by classes);

- Hierarchy of learning goals according to Bloom's taxonomy based on the levels of thinking skills on the most important types of cognitive regularity and subject methods;
- allowing to take into account intra-disciplinary connections of pedagogical goals for educational levels and the entire training course;
- the presence of "common topics" between subjects of the same field of education, as well as during the implementation of interdisciplinary connections;
- that the contents of sections and proposed topics meet the requirements of time, pay attention to the formation of social skills;
- technologicalization of the educational process in the form of a long-term, medium-term, short-term plan [4].
- increase the educational potential of teaching, formation of moral and spiritual qualities of the student (on the basis of the Patriotic Act of the Eternal Country);
- setting pedagogical goals for the full course of study, which allows to take into account the continuity of the subject between the educational levels [2];
- Systematic-action position in teaching (active participation in the student's learning process). The axiology of criterion-referenced assessment is implemented in the updated educational program based on these eight teaching methods [3].

The purpose of teaching the subject "Geography" at the basic (7-9) and (10-11) general secondary education levels: to educate students who are able to perceive the geographical image of the world as a whole, have developed geographical thinking skills, know and use the methods and language of geography, and have a geographical culture. is the formation and development of knowledge and skills, creating conditions for students to use their geographical knowledge, knowledge and skills aimed at solving geoecological, geoeconomic, social, geopolitical and global problems arising at all levels of society and geographical space. To achieve this goal, it is necessary to solve the following tasks:

- to provide an opportunity to understand the role of geography as a scientific discipline and its potential in solving modern human problems, as well as global problems;
- formation of students' scientific views on mutual relations between nature and society, spatial features of these relations;
- discovery of scientific, natural science, socio-economic bases of social production, nature protection and effective use of nature;
    a. promoting students' acquisition of geographical research methods and research skills;
    b. to contribute to students' mastery of concepts and terms of geography science;
    c. formation of students' spatial thinking and cartographic skills;
    d. formation of skills to use geographical knowledge in everyday life, in one's practice.
    e. development of geographical spatial thinking, geographical culture and language among students;
    f. development of understanding of global, regional and local positions for the study of geoecological, geopolitical, geoeconomic, social processes and phenomena;
    g. creating conditions for students to use modern methods of geospatial data processing during the study of cartography, geoecology, geoeconomics, geopolitics, country studies and global problems of humanity;
    h. formation of a system of values in the student during the study of the geographical view of the modern world through activities;
    i. formation of professional orientation skills for students by performing activities performed by professions and professions working with geospatial methods and data [4].

The main objectives of the research are to evaluate the implementation of criterion-referenced assessment within the updated educational program and its role in enhancing student learning outcomes, particularly in the context of 21st-century skill development. The article aims to provide both theoretical insights into the principles underlying criterion-referenced assessment and practical guidelines for teachers to improve instructional planning and assessment practices. Ultimately, it seeks to contribute to the improvement of assessment systems by aligning

educational content, teaching methods, and evaluation tools with global standards and the needs of Kazakhstani education.

III. METHOD

1. *RESEARCH DESIGN*

These skills can be implemented through effective planning of disciplinary integration, one of the innovative methods of forming professional orientation skills for students by performing activities performed by professionals and professions working with data, especially the latest geospatial methods. Integration (lat. Integration - restoration, addition, integer - whole) means to combine, integrate, integrate. It is necessary to base the axiology of learning and teaching on integration, subject integration. What is teaching? What is effectiveness and success in teaching? Effectiveness and success in training organization "how do we do?" raises the question, even if one of the most important questions in instructional management and leadership is "how?" Priority is given to teaching. Therefore, it is very important to promote invisible factors in the organization of training, not limited to visible training.

If we reveal the content of the concept of "learning", the analysis of the research work made it possible to identify five types of learning results:

1. Education as a quantitative increase of knowledge. Its result is the obtained information (the main task is "to know a lot").
2. Learning as memory. The result is a large amount of stored information that can be reproduced.
3. Reading as gathering information. The result is a significant collection of data, skills and techniques that can be memorized and used when needed.
4. Reading as understanding meaning and determining its meaning. The result of this is the student's ability to determine the interrelationships between the constituent parts of the subject and real life.
5. Reading as a way of understanding and interpreting reality differently. The result is to get to know the world by looking at it from a different angle [5].

2. *DATA COLLECTION*

Diagnosis of teachers' knowledge about the criterion system of education Pedagogical experiment was conducted as a survey for school teachers, geography subjects in centers of secondary professional education and geography teachers of higher educational institutions. The survey was conducted in the period from January 30 to April 11, 2023.

3. *PARTICIPANTS*

82 people participated in the survey. Out of 20 questions, 3 are open and 17 are closed. The purpose of the survey was to determine the knowledge and awareness of teachers about the system and content of criterion-referenced assessment of students' academic achievements in secondary school. Let's take a look at the results of teachers' responses to the online survey data.

Question 1. What field of education do you work in? to the first question, we can see that 67.1% of teachers work in schools, and 32.9% work in higher educational institutions.

We noticed that the teachers of higher educational institutions were interested in the survey and actively participated in it, which shows the relevance of the research work.

Question 2. Are you aware of the principle of criterion-referenced assessment of students' knowledge? Regarding this question, 45.1% of those who took part in the survey showed that they knew at a high level, 53.7% at an average level, and 1.2% at a low level. That is, it showed that the criterion evaluation system is very necessary for educational programs. In our opinion, it seems that it is necessary to conduct training and retraining courses according to the system of criterion evaluation of educational achievements of students.

Question 3. Have you passed advanced training courses on the criteria assessment system? to the question, the result was 43.9% of those who took the survey said that they had passed the course, that is, they had mastered the

"criterion evaluation system", 30.5% had not passed the course, and 25.6% of teachers said they wanted to pass the course.

Survey data revealed the need for advanced training courses and the need to widely cover teachers in the field of secondary and higher education.

Question 4. In the questionnaire "List the difficulties and problems encountered in criterion-referenced teaching", the teachers noted the following 28 main problems. Most of them identified 13 problems according to the evaluation system. 6 problems according to experience and qualifications, 5 problems related to material supply and organization, 3 problems related to the content of tasks and a differentiated approach, 1 problem of a subject nature (the subject was taken into account). As we can see from the results of this survey, we are convinced that there are difficulties and problems in the criterion-referenced education system (Table 1).

Table 1. Difficulties and problems encountered in criterion-referenced training

No.	Challenges and problems	Content of difficulties and problems
1	Evaluation	Assessment of students. There were clothes under current control. Evaluation system. Difficulty completing tasks. Sometimes it is not fair to evaluate each other. How to assess inclusive children in self-assessment? Evaluation criteria. Criteria for the assignment. In using assessment. Creating criteria for group evaluations. Inability to create a systematic task. Teachers have a hard time not being able to give marks to all students at the end of the lesson.
2	Experience and Qualifications	I did not pass the course. Criterion assessment requires constant research. Because of my lack of experience, it was difficult in every way. The high qualification of the teacher is lacking, the intelligence of the students is lacking. It requires thinking.
3	Content differentiation	Level of tasks. It's hard to tell the levels apart. Level tasks and developing children. Creation of criteria and descriptors.
4	Material and organizational	Paper work. Due to the fact that we have a paper journal, teachers had difficulty in calculating grades. Lack of resources in rural schools. Lack of time. The difficulty of the material.
5	Subject	Each subject has its own characteristics

Question 5. Your suggestions for improving the system of criterion-referenced training and professional development courses? to the question, teachers offered more than 20 suggestions, the vast majority of which are presented below (Table 2).

Table 2. Recommendations for the criteria evaluation system

No.	Directions	Recommendations
1	**Content**	**Organized by subject,**
2	Necessity	Training courses should be held frequently. Such courses are frequent. Must read. Openness, improvement. Need to be systematic.
3	Accessibility	If all teachers are given the same opportunity and done more often. If special master classes are organized for teachers, training of young professionals.
4	Organizational format	If it's local, you have to go offline. It should be small. Organization of courses within 72 hours. If the courses are practical, the modern methodology is the use of technology in solving many problems of modern education. If the organizer organizes courses on accumulation. Carrying out more awareness activities.
5	Exchange of experience	Each colleague shares his experience. Having evidence-based work to achieve results. A properly systematized STP is needed.
6	Material conditions	Since 2017, we have been witnessing that the requirements of the criteria assessment system of the majority are not being fulfilled, taking into account the situation in the current schools. That is why, even if teachers pass courses on the updated educational content, they do not meet the requirements and the requirements are not fulfilled.
7	Age and psychological	Attention to youth and psychological differences

8	Others	Reduce paperwork. If there is a suggestion box.

4. DATA ANALYSIS

As we can see from the suggestions of those who participated in the survey, we have noticed that those who want to master the criteria evaluation system in the education system, want to develop themselves and make changes to the evaluation system [6].

Question 6. What is the sign of evaluating the academic achievements of students? to the survey, 65.9% of the teachers correctly answered that it was an evaluation criterion, 18.3% said that it was feedback, and 15.9% said that it was a descriptor. As 34.1% of teachers did not answer correctly.

Question 7. Description / activity that describes the specific steps to perform the tasks? To this question, 69.5% of those who took part in the survey answered correctly by choosing a descriptor, 14.6% answered incorrectly as feedback, and 8.5% as self. That is, we will see that it is correct to create a descriptor for the performance of tasks, description and evaluation system in the evaluation system, and evaluate with the result of the descriptor. Because when each decryptor is evaluated individually, the student's exact score is obtained. The results of the survey showed that further work is needed to modernize and improve teacher training and retraining courses based on the criteria system of knowledge assessment, especially on determining the specific activities of educational activities to achieve educational goals.

Question 8. Responding to an action or event (outcome)? 59.8% of teachers gave the correct answer to the question, considering it to be feedback Because we can see the importance of feedback in the education system. That is, through feedback, we can find out the level of education of students, how well they have mastered the topic. Also, 23.2% of the survey participants said reflection, and generalization, self-assessment, and moderation were also found in this question.

Question 9. Assessing the educational achievements of students according to predetermined criteria, determining the degree of compliance of the actual results achieved by students with the planned educational goals? We can see that 42.7% of teachers who took part in the survey gave the wrong answer to this question, most of them were criterion evaluation. That is, 25.6% considered it to be a formative assessment, while 28% of them correctly identified it as a summative assessment for the assessment of students' academic achievements. We can see that it is important to know each part of the criterion-referenced evaluation system in evaluating academic achievement.

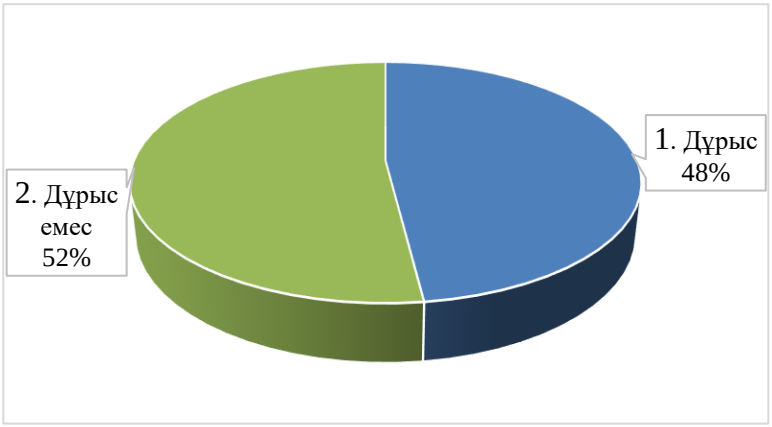
Question 10. What level of development of thinking ability should be evaluated in formative and summative assessment of students? to the survey, a clear majority of teachers, i.e. 67.1%, correctly indicated 6 rules of critical thinking, that is, formation of thinking skills, in the order of knowing, understanding, applying, analyzing, collecting, evaluating.

IV. RESULTS

Thus, a survey of geography teachers in secondary schools and pedagogical institutes and universities showed that, despite the fact that the Kazakh secondary education system has completely moved to the updated content of education in 2020, there are a number of problems in the field of educational competence of teachers and lecturers in terms of criterion evaluation of educational achievements [7]. Thus, only 48.24% of the 15 test questions presented according to the criterion evaluation system were correct (Figure 1).

Pedagogical experiment was conducted in Abay secondary school-gymnasium, Arkalyk city, Kostanay region. 9th graders participated in the experiment. From three parallel classes (9 A, 9 B, 9 B) 2 study classes were selected by random selection method - 9 A control group (CG), 25 students and 9 B experimental group (EG) 24 students.

One of the main tasks of pedagogical diagnostics was to assess the learning level of students, which allowed to determine how well the learning material was mastered, to identify their strengths and weaknesses. Pedagogical diagnosis helps to determine the individual characteristics of each student, such as abilities, interests, learning style and needs. It allows teachers to create individualized curriculum, adapt teaching methods and strategies to meet the needs of each student, and evaluate the effectiveness of educational programs, teaching materials, and methodologies. In addition, diagnostics revealed problem areas that require program correction or changes in teaching methods.



Note:
- 46% of the respondents rate their knowledge very well.
- 56% did not pass special training courses.
- 28 difficulties and problems in criterion evaluation of education.
- 23 proposals for improving the system of criterion evaluation of education.

FIGURE 1. the final indicators of the online survey of teachers according to the criteria system for evaluating students' knowledge, 48%.

Diagnostics in the learning process was used at all stages of the learning process, to monitor the learning progress of students and evaluate their achievements. It made it possible to receive feedback on the effectiveness of educational processes and take appropriate measures to improve the quality of education. The results of pedagogical diagnostics were used to develop plans for further training and development of students. It helped to determine the necessary corrections and modifications in the educational process, as well as to choose suitable methods and strategies to achieve learning goals. The results of the pedagogical diagnosis made it possible to adjust the general criteria system of education. The process of collecting and analyzing information about the achievements and characteristics of students made it possible to assess the current level of education, qualifications and skills of students, as well as to determine the effectiveness of the educational process. Let's consider the main steps of the algorithm of pedagogical diagnostics.

The first step was to define the goals and objectives of diagnostics. A clear definition of the objectives helps to gather the necessary information and conduct an appropriate evaluation. Depending on the goals and tasks of diagnostics, appropriate methods and tools were chosen for information gathering. These were tests, observations, interviews, questionnaires and other types of assessment. Further, the time of diagnosis is determined, the participants of the process are selected, the sequence of tests and other methods is made, taking into account the time and organizational limitations. The necessary information about the achievements of the students was collected. This includes testing, analyzing learning, monitoring student behavior and interactions, and receiving feedback from teachers, parents, or other stakeholders [8].

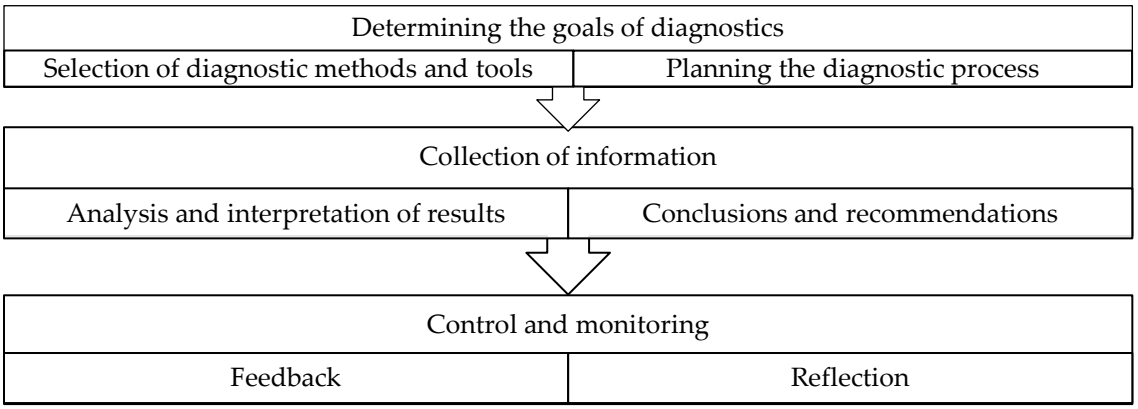


FIGURE 2. Pedagogical diagnosis algorithm

Diagnostics has been useful for assessing current knowledge that requires further study through prior knowledge tests, projects, assignments, presentations, portfolios, self-assessments, and more. We used several methods of diagnosis. Testing. Create test questions or use ready-made tests covering many topics on the topic. Various types of questions have been introduced, such as multiple choice, matching, short answer.

Self-assessment, allowing students to independently assess their knowledge and skills. This was done in the form of check sheets where they could assess their level of understanding in terms of topics and skills. After the information is collected, it is analyzed and interpreted. Results are assessed against established criteria and compared to expected learning objectives. Based on the analysis of the results, conclusions were made about the achievements and characteristics of students. At the last stage, feedback and reflection is carried out [9].

In the next stage, an ascertainment (identification, presentation) experiment aimed at obtaining descriptive data about phenomena or objects without their intervention and change was conducted. Such an experiment made it possible to establish clear connections between variables and to gain an understanding of existing relationships:

- defining the purpose of the research: what exactly we want to study and what information we want to get from the experiment.
- formulating the specific questions we want to answer.
- identifying the variables: identifying the main variables that we will study. The variables had to be measurable and controllable.
- definition of the sample: we have defined what we will study and what sample we will take for the study.

Diagnostic (introductory) period. The purpose of conducting diagnostics at this stage was to determine the initial level of students' mastery of the basic concepts and laws of the geography of the people of Kazakhstan.

Geography of Kazakhstan. 9th grade. Part 4 "Social geography". Learning objectives: 9.4.1.3 - analyze migration processes in Kazakhstan and determine the main directions; 9.4.1.4

- presents an original model of migration policy. The subject of the lesson: Migration of people in Kazakhstan. Diagnosing a higher level of thinking - migration processes. Level of thinking skills: analysis, summary assessment.

Task number 1. Define the concept of population migration, name the causes and types of migration. Content assignment no. 1. International migration of people. In January-March 2023, the number of people who came to the Republic of Kazakhstan was 7,680, and the number of people who left the country was 2,664. The balance of migration was 5,016 people. Compared to the corresponding period of 2022, the number of arrivals to Kazakhstan increased by 87.0%, while the number of departures from Kazakhstan decreased by 49.6%. The country's main migration exchange takes place with the CIS countries. The share of those who came from the CIS countries was 90.0%, and the share of those who went to these countries was 69.5%.

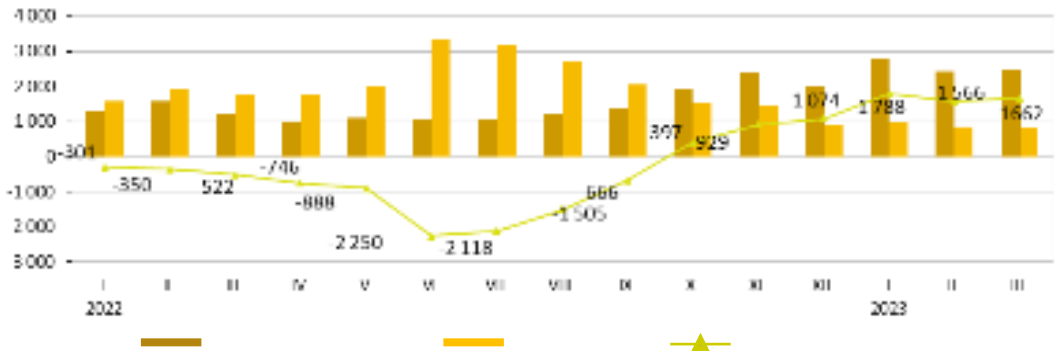


FIGURE 3. International migration of people

Task. Analyze the dynamics of international migration in Kazakhstan. Name the reasons for migration. Make pie charts. Content assignment no. 2. Interregional migration of people. The number of immigrants within

Kazakhstan decreased by 10.9%. The positive balance of population migration on interregional movements was formed in 4 regions of the country: Almaty (6,782 people), Astana (6,443 people) and Shymkent (241 people) cities and Almaty region (223 people).

Task. Analyze the dynamics of interregional migration in Kazakhstan. Name the reasons for migration. Your suggestions on reducing population migration to the cities of Astana, Almaty, Shymkent and Almaty region. Learning objective: 9.4.1.6 - Analyzes the demographic situation of Kazakhstan and presents its own model of demographic policy. The subject of the lesson: Demographic situation and demographic policy in Kazakhstan.

Diagnosing higher levels of thinking - demographic policy processes. Level of thinking skills: analysis, synthesis, evaluation. Task number 1. Fill in the table. Write down the factors that affect human life expectancy.

Factors affecting human life expectancy

Content assignment #1. Increased life expectancy. In recent years, an increase in the life expectancy of the population has been achieved in Kazakhstan. According to the results of 2022, the average life expectancy in the republic reached 77.44 years. Kazakhstan ranks 105th out of 193 countries in the 2022 life expectancy rating. Despite significant achievements, the situation can be very heterogeneous in the regions and regions of the republic. For example, the life expectancy of those born in Almaty has the highest value - 77.32 years, and the lowest life expectancy - 71.44 years in Ulytau region.

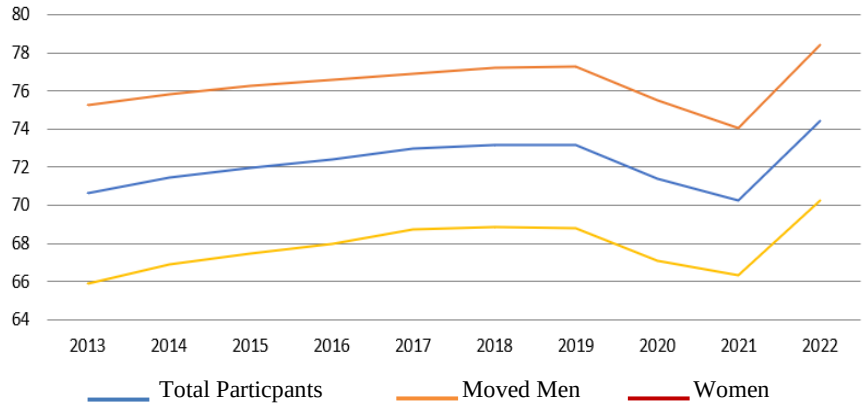


FIGURE 4. Life expectancy in Kazakhstan

1.1 Formative period.

Formative learning is a process in which EG learners actively participate in the formation of knowledge, skills and competences. The learning objectives and expected outcomes that we wanted to achieve were defined. Goals were measurable, specific, and attainable. We have organized active learning situations. We gave students the opportunity to discuss, self-evaluate and evaluate each other. In turn, it helped them to actively use knowledge and develop skills. We always supported collective training. Encouraged classmates to share their ideas and cooperate. This was done through group assignments, discussions, partnership work or collaborative projects. Students should be given regular feedback on their work to help them understand their progress and areas for improvement [10].

Feedback was constructive, contributed to the development and motivation of students. Encouraged reflection and self-evaluation. Various teaching methods were used (lecture, discussion, practical lessons, group work, technology and other methods). During the lesson, the progress of the study was evaluated, and proposals for the next lessons were developed based on the future learning goals (additional). We constantly evaluated the progress of educational achievements.

1.2 Control period

Summative assessment for department and quarter. Summative assessment of knowledge by section and quarter is usually conducted to assess the general understanding level of students on a certain topic, content block (section and quarter) [11].

Summative assessment begins by defining the purpose and objective of the assessment (the specific aspects of knowledge, skills, or competence to be assessed in a given unit or term). Standards and requirements established in the curriculum or program are taken into account. Assessment formats are developed (choose a suitable assessment format such as tests, written assignments, projects, oral presentations or practical assignments). It is important to consider the assessment objectives and level of difficulty to ensure the appropriateness of the material studied in the unit. Next, assessment criteria are created (list of key concepts, required skills or answer structure). Materials and instructions (tests, tasks or project specifications) are prepared. Ensure that instructions are clear to students and that all necessary resources are available during assessment. At the next stage, evaluation is carried out (evaluation according to selected formats and guidelines, fair and consistent evaluation according to predetermined criteria). Based on the results of the evaluation, the results are analyzed (information is provided to assess the level of understanding of the general class and to determine the individual needs of students).

At the last stage, feedback is carried out (students are given feedback on the results of the assessment. Their strengths and directions for further improvement are indicated [12].

V. CONCLUSION

One of the conditions of social reconstruction in the Republic of Kazakhstan is to improve and modernize the effectiveness of the educational process in the secondary education system by providing the teacher with objective information about the progress of educational and cognitive activities of the students. In recent years, the policy implemented in the field of secondary education is being implemented in order to integrate it into the global educational space and bring it closer to international educational standards.

The results obtained in the course of the research allowed us to make the following conclusions:

1. Measuring the quality of education, as well as evaluating the results of academic achievements, has attracted the interest of secondary school teachers. Therefore, during the transition from the traditional paradigm of education to a person-oriented paradigm, teachers need to reconsider the relationship between academic achievement and the assessment system. The teacher can obtain this information during the process of monitoring the educational and cognitive activity of students in the case of updated content and criterion-referenced teaching.
2. Formation and monitoring of educational achievements during criterion-referenced education is considered as a process aimed at formation and evaluation of educational achievements. In accordance with this, activities are carried out using various pedagogical measures and measurement methods to obtain information about the progress and results of training, develop subject and meta-subject competences, critical and creative thinking, functional literacy.
3. Examination and assessment of students' knowledge depends in many cases on their study subject, their attitude to study, the formation of interest in the subject, as well as important qualities such as independence, initiative, hard work. suggestions, help and together with his learning efforts and achievements, adjustments can be made to the learning process.
4. One of the important conceptual rules for updating educational content is the competence approach. The use of such an approach brings innovation to a new view of educational content, methods, teaching and assessment technologies. The main units of the update are the concepts of competence and competence, which become integrative indicators of the assessment of the quality of education.
5. The main goal of modern high school education should be education aimed at a person who is ready for effective interaction with the outside world, self-education and self-development. In order to achieve academic independence, the child's independence along with self-monitoring and assessment, that is, willingness and ability to monitor and evaluate his own activities, to identify and eliminate the causes of problems, is of particular importance.

6. A Google survey was conducted on the criterion evaluation of geography teachers and high school teachers, and if we look at the results of the survey, it was found that there are still problems. In this regard, in order to determine the organizational-pedagogical basis of the criteria assessment technology, the criterion assessment methodology for the formation of educational and cognitive competence of students in geography lessons, a model of practical implementation of this technology was developed.
7. It is possible to solve the evaluation of students' educational achievements by forming a criterion evaluation, checking the results of students' mastery of basic educational programs, and using a properly set and organized system of the pedagogical process.
8. In the practice of formation of educational and cognitive competence through criterion-referenced assessment, the model of criterion-referenced assessment technology, which includes the purpose, principles, and assessment policy of the educational process of the school, which includes the complex of criterion-referenced assessment organization technologies, organizational-pedagogical conditions and the resulting component of the criterion-referenced assessment technology application, is implemented.
9. As a result of the dissertation research, pedagogical principles based on the laws of connection between criterion and descriptive, formative and determining assessment, awareness and diagnosis were determined. They are intended to regulate certain parameters in the evaluation of geography teacher's activities.
10. The results obtained during the pedagogical diagnosis of determining the level of formation of educational-cognitive competence of students in geography lessons fully confirmed the research hypothesis and proved the effectiveness of using the technology of criterion evaluation of students' educational achievements and its effect on the formation of educational-cognitive competence. In addition, the importance has been experimentally proven of the interrelationship of all studied components (motivation, students' attitude to the teacher's grade, mutual evaluation, self-evaluation), which allows to determine the quantitative and qualitative parameters of the criterion evaluation as a technology for the formation of educational-cognitive competence of students in geography lessons. it was determined that it is aimed at learning, critical and creative thinking.
11. In order to increase the effectiveness of teaching and the professional competence of teachers in geography classes, the educational tool prepared according to the criterion system for evaluating educational achievements is offered with methodological assistance.
12. The course of experience at the school showed that subject teachers are interested in research related to criterion-referenced assessment in the geography class in the context of criterion-referenced assessment, which may be due to the lack of methodological recommendations on this issue and insufficient experience of young teachers in education. These gaps can be supplemented by special courses, master classes and seminars organized according to the content of the subject.

Future research should explore the long-term impact of criterion-referenced assessment on student outcomes across various subjects and grade levels, particularly focusing on its role in developing critical thinking and problem-solving skills. Additionally, studies could investigate the effectiveness of teacher training programs in equipping educators with the necessary tools and understanding to implement this assessment method effectively.

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Author contribution

All authors made an equal contribution to the development and planning of the study.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data are available from the authors upon request.

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